THE SUNDAY TIMES

THE VALLEY

And the Bay Area

SUNDAY, MAY 9, 1999

Research focuses on clouds, light

■ A pilotless plane is being used to gather data at high altitudes to study how cirrus formations affect sunlight

By Andrea Widener
TIMES STAFF WRITER

From the ground, clouds might look like a parade of rabbits and elephants and little red wagons.

But when scientists peer skyward, they see a chain of atmospheric mysteries that, if solved, might help them better understand sunlight, weather and global warming.

While researchers understand the basics of what creates clouds, they are foggy on the specifics of how these cotton balls in the sky contribute to the bigger weather picture. Especially puzzling are the high-flying wispy clouds named cirrus.

Throughout this month, a team of scientists led by Sandia/California Laboratory are sending a pilotless plane high above thin, curly clouds near Hawaii to gather data about how they work. They hope the flights will tell them more about how sunlight and clouds interact.

"We are interested in the ... energy above and below the clouds,"

See PLANE, Page A24

SPECIAL TO THE TIMES

THE REMOTE-CONTROLLED Altus II flies over the Southern California. The NASA plane is designed for scientific sampling missions.

Plane

FROM PAGE A21

said Sandia scientist Will Bolton, who manages the program.

When light streams in from the sun, it speeds through many layers of clouds before it reaches the Earth. Each of these layers bounces the light around like popcorn in a movie popper.

The atmosphere, in the form of water vapor and dust, absorbs some of the sunlight's energy. The rest does one of three things when it reaches a cloud: it reflects off the top, stays in the cloud or shoots through unobstructed. How much light gets through depends on the kind of clouds it encounters.

Puffy clouds close to the ground reflect lots of light, but they also absorb its energy because they're filled with water droplets, explained Lawrence Livermore physicist Ric Cederwall.

By contrast, the wispy cirrus clouds that drape the upper atmosphere like sheer curtains are filled with ice instead of water. That means very little light is absorbed in the clouds, but it also means more is reflected by the angular ice crystals.

Cirrus clouds are so high — about 40,000 feet above the ground — that they have been difficult to study, said Bob Ellingson, the mission's head scientist and a meteorology professor at the University of Maryland, College Park.

"We really don't understand the overall role of cirrus clouds in adding water to the atmosphere," Ellingson said.

And that's where the pilotless plane comes in.

The plane — a thin, white marvel with a nose like a dolphin and long, flat wings — was designed to carry instruments above the clouds and stay there for hours.

That's perfect for scientists from Sandia and Lawrence Livermore laboratories and several other labs and universities who have designed the instruments on board.

Those instruments examine how much sunlight comes toward the cloud and how much bounces off it. The also probe the size of the cloud's ice crystals and its depth, as well as take the more standard weather measurements, like temperature and pressure.

"We want to know how much is reflected from the top of the cloud and how much passes through," Bolton said. "That balance of energy is not well known.

The plane, called Altus II, flies between 50,000 and 55,000 feet, just high enough to stay above most clouds near the Pacific Missile Range Facility on Kauai Island. It stays aloft for up to seven hours.

"You don't have to worry about a cockpit," said NASA's James Stewart. "You don't have to protect an individual at that kind of altitude."

A second manned plane carrying similar instruments flies far below at 10,000 feet, squishing the cold clouds in between like an ice-cream sandwich. That gives the researchers data so they know what's going into the cloud at the top and what is coming out at the bottom.

This is the first time the scientists have tried this setup, and already they are getting some interesting data that they can use to make more accurate models of both the weather and climate change.

Eventually, the researchers hope to make a trip near the equator, where much of the world's intense weather patterns originate and where clouds lift tons of moisture aloft. And they want the trip to last 24 hours, something that's nearly impossible if you put people on board.

"As the sun rises and sets, there is a huge difference," Bolton said. "By observing that entire cycle, it provides a fairly unique set of data."

The data will eventually make their way into computer models of the Earth's climate, which now have only crude representations of clouds, Cederwall explained. Clouds generally form in smaller spaces than the computer models, which work over areas the size of states.

"The idea is to be able to make sense of the major types of clouds and eventually model them," Ellingson said. "This will help us understand that."

Andrea Widener covers science and the area's national laboratories. You can reach her at 925-847-2158 or awidener@cctimes.com.